

CLAIMS

1. Method of generating line properties of a signal line including generating (401) a frequency dependent line input impedance ($Z_{in}(f)$) for a loop, the loop including the signal line (2) and a remote device (3), the method being characterized by:
 - Generating (402) an absolute value function ($|Z_{in}(f)|$, A1) from the frequency dependent line input impedance ($Z_{in}(f)$), the function being essentially periodic;
 - 10 - Selecting (408) at least two consecutive extreme values (Max1;Max2) of the same type of the absolute value function ($|Z_{in}(f)|$);
 - Generating (409) a frequency distance (FD1) based on said at least two extreme values;
 - 15 - Generating (410) a line length value (L) based on the frequency distance (FD1) and a velocity of propagation (vop) for a signal on the signal line (2).
2. Method of generating line properties of a signal line according to claim 1, wherein the frequency distance is a mean value (MV1,MV2,MV3) between at least two different frequency distances (FD1-FD4), each of which reaches between two consecutive ones of the extreme values (Max1,Max2,Max3; Min1,Min2,Min3) of the same type.
3. Method of generating line properties of a signal line according to claim 1 or 2, the method being performed as a single ended loop test and including:
 - selecting a test transceiver (31) suitable for communication purposes;

- connecting (603), in a calibration process, at least three impedances (9) of each a predetermined value to a signal line connection (5) of the test transceiver (31);
- generating (606) frequency dependent echo transfer functions ($H_{echo}(f)$) utilizing test signals (vt_{in} , vt_{out}) and said at least three impedances (9); and
- generating (608) transceiver model values ($Z_{h0}(f)$, $Z_{hyp}(f)$, $H_a(f)$) with the aid of said echo transfer functions ($H_{echo}(f)$) and the corresponding impedance values (9), said model values including an echo transfer function ($H_a(f)$) for the test transceiver (31) with open line connection (5), a transceiver impedance value ($Z_{hyp}(f)$) as seen from the line (2) side and a product ($Z_{h0}(f)$) of said transceiver impedance value ($Z_{hyp}(f)$) and an echo transfer function ($H_a(f)$) for the transceiver (31) with shortcut line connection (5).

4. Method of generating line properties of a signal line according to claim 3 including storing (609) the transceiver model values ($Z_{h0}(f)$, $Z_{hyp}(f)$, $H_a(f)$) obtained in the calibration process.

5. Method of generating line properties of a signal line according to claim 4 including:

- selecting (610) a transceiver (1) for communication purposes of the same type of hardware as said test transceiver (31) in the calibration process;
- connecting (701) the loop to the transceiver (1);
- sending (702), via the connected transceiver (1), a loop test signal (v_{in}) to the line (2);

- measuring (703), via said transceiver (1), the loop test signal (v_{out}) as reflected;

- generating (704) a loop echo transfer function ($H_{echo}(f)$) for the loop (2,3);

5 - generating (705) the frequency dependent line input impedance value ($Z_{in}(f)$) for the loop (2,3) with the aid of the stored transceiver model values ($Z_{ho}(f), Z_{hyp}(f), H_{in}(f)$) and the generated echo transfer function ($H_{echo}(f)$).

6. Method of generating line properties of a signal line according to claim 1, 2 or 5, wherein a short loop length decision value ($dValue$) is estimated, the method including:

- generating, in a predetermined loop length frequency range (f_1-f_2), an impedance mean value ($mValue$) of the absolute value ($|Z_{in}(f)|$) of the line input impedance ($Z_{in}(f)$);

15 - generating, in the loop length frequency range, the short loop length decision value ($dValue$) based on the line input impedance ($Z_{in}(f)$) and said impedance mean value ($mValue$);

- comparing the short loop length decision value ($dValue$) with a predetermined threshold value ($thValue$);

- deciding the loop to be a short loop based on said comparison.

7. Method of generating line properties of a signal line according to claim 1, 2, 5 or 6 including:

25 - calculate an average attenuation value (AA1) for a selected set of telecommunication cables;

- estimate the length (L) of the short signal line (2);

- generate an attenuation value (LA1) for the line (2) by multiplying the average attenuation value (AA1) with the line length (L).

8. Method of generating line properties of a signal line
5 according to claim 1, 2, 5 or 6 including:

- selecting one of the minimum values (Min1) of the absolute value function ($|Z_{in}(f)|$, A1) and an adjacent of the maximum values;
- generating an insertion loss (loss) value for the line (2)
10 based on said minimum and maximum values.

9. An arrangement for generating line properties of a signal line, the arrangement including a front end device (MD1;1) having connections (5) for a loop including the signal line (2) and a remote device (3), the arrangement including
15 circuits (LU1;42,42,43) in the front end device (MD1;1) for generating a frequency dependent line input impedance ($Z_{in}(f)$) for the loop, the arrangement being characterized by:

- a calculation unit(CU1;11) for generating an absolute value function ($|Z_{in}(f)|$) from the frequency dependent line input impedance ($Z_{in}(f)$), the function being essentially periodic;
- circuits in the calculation unit (CU1;11) suitable for:

a). selecting at least two consecutive extreme values
25 (Max1,Max2) of the same type of the absolute value function ($|Z_{in}(f)|$);

b). generating a frequency distance (FD1) based on said at least two extreme values;

c). generating a line length value (L) based on the frequency distance (FD1) and a velocity of propagation (vop) for a signal on the signal line (2).

10. An arrangement for generating line properties of a
5 signal line according to claim 9, wherein the calculation
unit (CU1;11) is arranged for calculating a mean value
(MV1,MV2,MV3) between at least two different ones of the
frequency distances (FD1-FD4), each of which reaches between
two consecutive ones of the extreme values (Max1,Max2,Max3;
10 Min1,Min2,Min3) of the same type.

11. An arrangement for generating line properties of a
signal line (2) according to claim 9 or 10, wherein the
front end device is a transceiver (1,31) for communication
15 purposes, the arrangement in a calibration mode including:

- a test transceiver (31) connected to a measurement device (32);
- the measurement device (32) being arranged to generate, in
20 a calibration process, calibration values for the
transceiver (1,31) for communication purposes with the aid
of at least three impedances (9) and test signals ($v_{t_{in}}$,
 $v_{t_{out}}$), the impedances (9) having each a predetermined
value and being connected to the line connection (5) of
the test transceiver (1, 31);
- the measurement device (32) being arranged to generate a
frequency dependent echo transfer function ($H_{echo}(f)$) for
the test transceiver (1,31) connected to the respective
one of the impedances (9);
- the measurement device (32) being arranged to generate
30 transceiver model values ($Z_{ho}(f)$, $Z_{hyb}(f)$, $H_{\infty}(f)$) with the aid

of said echo transfer function ($H_{echo}(f)$) and the corresponding impedance values (9), said model values including an echo transfer function ($H_e(f)$) for the transceiver (1, 31) with open line connection (5), a transceiver impedance value ($Z_{hyb}(f)$) as seen from the line (2) side and a product of said transceiver impedance value ($Z_{hyb}(f)$) and an echo transfer function ($H_0(f)$) for the transceiver (1, 31) with shortcut line connection (5); and

10 - the transceiver for communication purposes (1,31) being arranged to generate the frequency dependent line input impedance ($Z_{in}(f)$) with the aid of the transceiver model values ($Z_{h0}(f), Z_{hyb}(f), H_e(f)$).

12. An arrangement for generating properties of a signal line (2) according to claim 11, the arrangement including a memory (12, 33) for storing the transceiver model values ($Z_{h0}(f), Z_{hyb}(f), H_e(f)$).